

REMARKS

The application has been carefully reviewed in light of the Office Action dated November 17, 2003. Claims 1, 3, 9, and 16 have been amended. Claims 40-42 have been added. No new matter has been added. Support for these new claims can be found in the original specification, for example, at p. 13, [0045]. Claims 1-21 and 40-42 are pending in this case. Reconsideration and withdrawal of all outstanding rejections are respectfully requested.

Claims 1 and 16 stand rejected under 35 U.S.C. § 112, second paragraph. The claims have been amended to provide sufficient antecedent bases for the limitations “said layers.” For at least these reasons, withdrawal of this rejection is respectfully requested.

Claims 1-21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,110,648 to Jang (“Jang”) in view of U.S. Pat. No. 6,326,218 Yunogami et al (“Yunogami”). The rejection is respectfully traversed and reconsideration is requested.

The present invention relates to a method for improving surface planarity prior to bit material deposition for MRAM cells. The subject matter of claims 1-21 would not have been obvious over Jang in view of Yunogami at the time of invention. Specifically, the Office Action does not establish a *prima facie* case of obviousness, which requires “some motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings . . . [and] the prior art reference (or references when combined) must teach or suggest all the claim limitations.” M.P.E.P. § 2143.

Even if, *arguendo*, there was some motivation to combine the teachings of Jang with the teachings of Yunogami, the combination does not render the claimed invention obvious. Neither Jang nor Yunogami, whether considered alone or in combination, recite all of the limitations of the claimed invention.

Independent claim 1 recites a method comprising *inter alia*, “forming a second layer of a conductive material over said barrier and said first conductive layers; and removing an upper portion of said second conductive layer. . . while leaving a lower portion of said second conductive layer intact over said first conductive layer and said barrier layer.” Thus, the claimed method leaves a second conductive material covering a top surface of both a barrier layer and a conductive layer which are formed in a trench.

Jang discloses removal of a second barrier layer 165, which the Office Action correlates to the claimed second conductive layer. Jang teaches, however, a different removal step than the method recited by claim 1. With reference to FIG. 3f, the barrier layer 165 is removed everywhere except for the area over the copper conductor, including removal of the barrier layer from the area over the insulating layer, corresponding to the claimed barrier layer. Accordingly, Jang does not teach or suggest “leaving a lower portion of said second conductive layer intact over said first conductive layer and said barrier layer,” as recited by claim 1.

Yunogami does not cure these deficiencies of Jang. For at least these reasons, withdrawal of the rejection of claim 1 is respectfully requested. Claims 2-9 depend from claim 1 and are allowable at least for these reasons and for the unique combinations recited therein.

Independent claim 10 recites a method comprising, *inter alia*, “forming a material layer *over said flattened upper surface*; and flattening an upper portion of said material layer while *leaving intact a lower portion of said material layer over said insulating layer* and said first conductor.” The Office Action relies on the teachings of Jang for disclosing these steps. More specifically, the Office Action relies on the second barrier layer, copper connect, and first barrier layer as teaching the material layer, first conductor, and insulating layer, respectively, as recited by claim 10. (Office Action, p. 3).

Analysis of Jang’s method, however, as depicted in Figures 3a-3f, reveals that Jang does not disclose or even suggest these claim limitations. Jang teaches that the

“copper metal is next etched back so as to form a cavity. . .[and] a second barrier layer is next formed over the cavity.” (Col. 6, lines 49, 63). Thus, unlike the claimed method, Jang teaches an upper surface of a copper metal having a cavity, not flattened.

Moreover, as explained above, Jang teaches that the barrier layer is removed everywhere except for the area over the copper conductor, including removal of the barrier layer from the area over the insulating layer. Accordingly, Jang does not teach or suggest “forming a material layer over said *flattened* upper surface” nor “*leaving intact a lower portion of said material layer over said insulating layer* and said first conductor,” as recited by claim 10.

Yunogami does not cure these deficiencies of Jang. For at least these reasons, withdrawal of the rejection of claim 10 is respectfully requested. Claims 11-15 depend from claim 10 and are allowable at least for these reasons and for the unique combinations recited therein.

Independent claim 16 recites a method comprising forming a material layer over a roughened surface of a conductive layer, flattening a top surface of said material layer and “forming at least one magnetic layer over said flattened upper portion of said material layer.” Neither of the cited references, whether taken alone or in combination teach or suggest all the limitations of claim 16. The Office Action relies on Yunogami as teaching a process of forming a memory device. (Office Action, p. 3). Neither reference, however, teaches or suggests forming magnetic layers. More specifically, neither reference teaches or even suggests forming magnetic layers over the flattened material layer surface, as recited by claim 16.

For at least these reasons, claim 16 should be allowed. Claims 17-21 and 40-42 depend from claim 16 and should be allowable for at least these reasons and for the unique combinations recited therein.

Finally, the subject matter of claims 1-21 would not have been obvious over Jang in view of Yunogami at the time of invention because there existed no objective

motivation or reason to combine the two reference teachings, as required to support a *prima facie* case of obviousness. M.P.E.P. § 2143.

Jang teaches an enclosed copper conductor in a dual damascene structure. (Abstract). Yunogami, on the other hand, teaches a method for using a thin film, such as platinum, as a mask structure for preventing damage to an underlying ruthenium film during integrated circuit fabrication. (Abstract). Yunogami does not discuss anything relating to copper conductors, and likewise, Jang does not discuss anything relating to platinum metal mask structures. Accordingly, one of ordinary skill in the art would not have been motivated to combine the cited references.

Specifically, the Office Action asserts that “it would have been obvious to one having ordinary skill in the art at the time the invention was made to use Jang’s process in memory device and using Ti or TiN as first conductive material as suggested by Yunogami.” (Office Action, p. 3). The Applicant respectfully disagrees. Jang does not suggest or provide any motivation for using his process in a memory device; and further, Jang teaches away from using any material other than copper as a first conductive material. Jang teaches the damascene structure is filled “with copper of this invention.” (Col. 6, line 45; see also Col. 5, lines 12-13 explaining “Referring now to the drawings. . .there is shown a method of enclosing copper conductors in a protective barrier”).

For at least these reasons, the combination of Jang and Yunogami is improper, and withdrawal of this rejection under 35 U.S.C. § 103 is respectfully requested.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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